DOCUMENT RESUME

ED 082 510 EM 011 483

AUTHOR	Bjerstedt, Ake, Ed.
TITLE	Subject-Matter Oriented Research: Some Current Projects at the Malmo School of Education.
INSTITUTION	School of Education, Malmo (Sweden). Dept. of Educational and Psychological Research.
PUB DATE	Aug 73
NOTE	42p.; Didakometry Number 39
EDRS PRICE	MF-$0.65 HC-$3.29
DESCRIPTORS	Concept Formation; *Educational Research; Educational Technology; Individualized Instruction; *Intellectual Disciplines; Mathematics Instruction; *Program Descriptions; Second Language Learning; Vocational Education; Writing
IDENTIFIERS	*Sweden

ABSTRACT

Research carried out at the Department of Educational and Psychological Research at Malmo (Sweden) dealing with major subject-oriented projects is described in this report. Included are discussions of projects on individualized mathematics teaching, instructional methods in German, studies of factors that affect concept formation and learning, vocational training problems, composition in the intermediate stage of the comprehensive school, and effects of mathematics teaching. (SH)

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ED 082510

special-topic
bulletin from

DEPARTMENT OF
EDUCATIONAL AND
PSYCHOLOGICAL RESEARCH

SCHOOL OF EDUCATION
MALMÖ, SWEDEN

didakometry

Bjerstedt, Å. (Ed.):

SUBJECT-MATTER ORIENTED RESEARCH:
SOME CURRENT PROJECTS AT THE
MALMÖ SCHOOL OF EDUCATION

No. 39 August 1973

EM 011483

ED 087510

SUBJECT-MATTER ORIENTED RESEARCH: SOME CURRENT PROJECTS AT THE MALMÖ SCHOOL OF EDUCATION

Åke Bjerstedt (Ed.)

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The research being carried out at the Department of Educational and Psychological Research at the Malmö School of Education may be sub-divided into four major sub-sections: (1) subject-matter oriented, (2) instructor-oriented, (3) pupil-oriented, and (4) environment-oriented. Each section consists of a group of independent projects with some similarities in research area and approach. In the present survey report the major research projects of the first of these sub-sections are presented. For those who want more information, notes on contact persons and references are enclosed.

Keywords: Educational research, Sweden; educational technology; materials-and-methods systems; language instruction; mathematics instruction

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PREFACE

For some years the research carried out at the Department of Educational and Psychological Research at the Malmö School of Education has been informally sub-divided into four major sub-sections: (1) subject-matter oriented research, (2) instructor-oriented research, (3) pupil-oriented research, and (4) environment-oriented research. Each section consists of a group of independent projects with some similarities in research area and methodological approach.

In the present survey report the major research projects within the first of these sub-sections are presented.

Some of these subject-matter oriented projects are also product-oriented, that is, they include attempts systematically to produce study materials, packages of study materials, or materials-and-methods systems. The two most typical examples are the IMU project (dealing with individualized mathematics instruction) and the UMT project (dealing with German as a foreign language). None of the projects are exclusively product-oriented, however. Basic research on prerequisites and methodological processes has had to proceed hand-in-hand with the development of material.

Our knowledge of fundamental relationships between educational procedures and outcomes are still limited. Research clearly related to concrete school learning situations within various subjects is much needed, but it is also of importance to try out the degree of generality over various subject-matter areas. A project on concept formation is an example of this orientation.

For projects of these types, teams of experts (educational researchers, subject-matter experts, experienced teachers) are of importance; team research characterized by a high degree of role differentiation is typical for several of our projects.

For those who want more information, notes on contact persons and references are enclosed.

A. B.

INDIVIDUALIZED MATHEMATICS TEACHING (IMU)

Contacts: Inger Larsson, Bernt Larsson

Main aims

The objectives of the IMU project are to

a) construct and test self-instructional study material in mathematics
b) test suitable teaching methods for the use of this material
c) test different ways of grouping the pupils and utilizing the teachers in order to gain a maximal effect from the material and methods
d) measure by means of the material constructed the effects of individualized teaching.

Background to the IMU project

A series of educational reforms have been carried out in Sweden during the post-war period. During the first stage it was mainly a question of external organizational changes. Subsequently these changes led to increasing demands for improvements to be made within the educational establishments involved. Among other things it was requested that within the framework of the established organization new teaching material should be introduced, better study materials made available and other forms of activity complement those commonly occurring. These requests initiated new lines of thought about the organization of the internal work of the school.

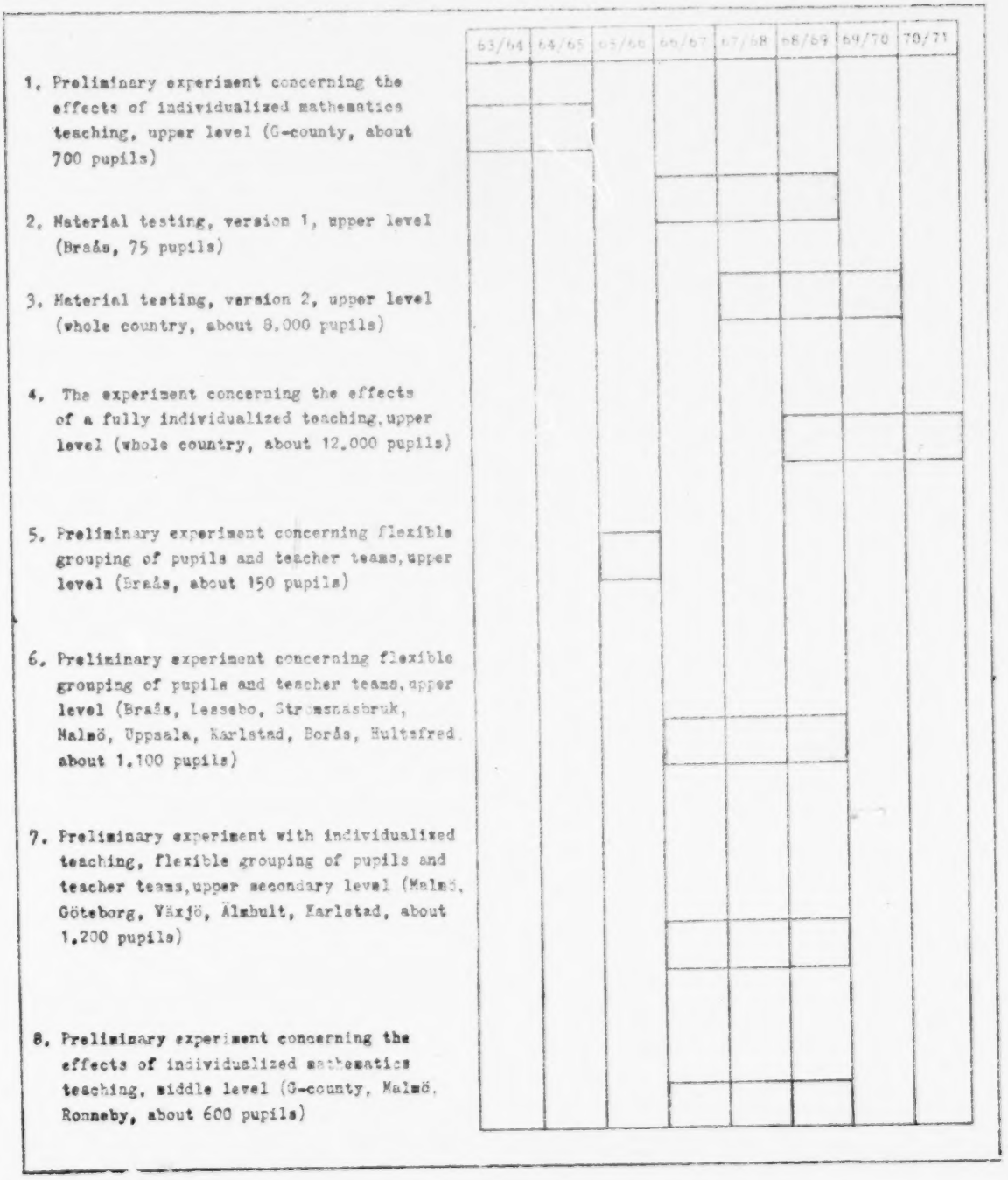
In the general debate on educational problems, the content of the material for the teaching of mathematics and the methods used in the teaching occupied a relatively dominant position. The discussion involved both the comprehensive school and the upper secondary school. In order that mathematics teaching might, if possible, be changed for the better, some experimental activity was initiated. One of the prime movers in this was the Nordic Committee for the modernization of mathematics teaching. A certain amount of this experimental work was planned within the framework of the IMU project.

In the autumn of 1963 a study commissioned by the National Board of Education was set up with the purpose of comparing the effects of completely individualized teaching and conventional teaching in the subject of mathematics in grades 7 and 8. The results of the first year of the experiment were such that it was considered worthwhile to follow up the work. Therefore in the autumn of 1964 the National Board of Education (Section L4) started the IMU

project. The original study was incorporated into the project in the form of a preliminary study.

A whole series of experiments has been carried out within the framework of the project, of which one is the investigation of effects. Box 1 presents a summary of the different field experiments, which will be briefly commented upon here.

Box 1. Field experiments, a summary.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1. Preliminary experiment concerning the effects of individualized mathematics teaching, upper level (G-county, about 700 pupils)
2. Material testing, version 1, upper level (Borås, 75 pupils)
3. Material testing, version 2, upper level (whole country, about 8,000 pupils)
4. The experiment concerning the effects of a fully individualized teaching, upper level (whole country, about 12,000 pupils)
5. Preliminary experiment concerning flexible grouping of pupils and teacher teams, upper level (Borås, about 150 pupils)
6. Preliminary experiment concerning flexible grouping of pupils and teacher teams, upper level (Borås, Lessebo, Strömsnäsbruk, Malmö, Uppsala, Karlstad, Borås, Hultsfred about 1,100 pupils)
7. Preliminary experiment with individualized teaching, flexible grouping of pupils and teacher teams, upper secondary level (Malmö, Göteborg, Växjö, Älmhult, Karlstad, about 1,200 pupils)
8. Preliminary experiment concerning the effects of individualized mathematics teaching, middle level (G-county, Malmö, Ronneby, about 600 pupils)

Field experiment 1 was the preliminary experiment mentioned above, concerning the effects of individualized mathematics teaching. This was carried out in grades 7 and 8 during the school years 1963/64 and 1964/65. During the school year 1965/66 this was supplemented with a preliminary experiment concerning the flexible grouping of pupils and team teaching (field experiment 5) and during the school years 1966/67 and 1968/69 with an expanded experiment (field experiment 6).

During the school year 1965/66 the production of version 1 of the material was started and the material was then tested starting with the school year 1966/67 at a school, Braås, with about 75 pupils participating (field experiment 2). This testing of the material resulted in version 2 of the IMU material, which was constructed parallel with the completion of version 1. The material was tested on about 300 pupils in the Växjö districts, while a more general collection of data was carried out on all the approximately 8.000 pupils and 200 teachers who had been working with this version during the school years 1967/68 - 1969/70 (field experiment 3).

The testing of version 2 resulted in version 3 of the IMU material, which is the version used in the investigation of effects (field experiment 4). The investigation of effects started in the school year 1968/69 and was completed 1970/71.

As can be seen in Box 1, the project has mainly worked with the upper level of the comprehensive school. Some preparatory experiments have been carried out in both the upper secondary school and the middle level (field experiments 7 and 8). Both experiments started in the school year 1966/67 and were concluded in the school year 1968/69.

In addition to these field experiments, there is the work that has resulted in the IMU project's goal descriptions for self-instructional study material in mathematics. This work was started in the school year 1965/66 and the goal descriptions and collection of examples was published in December 1966.

The results from the project's different areas of activity in addition to the investigation of effects have been reported in the following reports and bulletins:

Field experiment 1: Öreberg, C. IMU-projektet: Rapport från pågående försök. Pedagogisk-psykologiska problem, No. 8, 1964.

Individualiserad matematikundervisning. Kommunal Skoltidning, No. 5, 1965.

Försök med individualiserad matematikundervisning. Pedagogiska Meddelanden, No. 9, 1965. (Also available in off-print from the Department of Educational and Psychological Research in Malmö, No. 12, 1965.)

Field experiment 2: Öreberg, C. Material för individualiserad matematikundervisning. Pedagogiska Meddelanden, No. 7, 1966.

Field experiment 3: Jivén, L. M. IMU-projektet: Rapport från utprövning av IMU-systemet på grundskolans högstadium (I). Pedagogisk-psykologiska problem, No. 63, 1968.

Jivén, L. M. IMU-projektet: Rapport från utprövning av IMU-systemet på grundskolans högstadium (II). (Manuscript.)

Field experiment 5, 6: Öreberg, C. Försök med flexibel elevgruppering och lärarlag. Pedagogiska Meddelanden, No. 3, 1966.

Field experiment 7: Jivén, L. M. IMU-projektet: Försök med individualiserad matematikundervisning på gymnasium. (Manuscript.)

Field experiment 8: Hellström, L. IMU-projektet: Försök med individualiserad matematikundervisning på grundskolans mellanstadium. Pedagogisk-psykologiska problem, No. 157, 1972.

The IMU-project's goal descriptions and collection of examples are reported in:

The IMU system. Description of objectives. The Swedish National Board of Education. (Stencilled.)

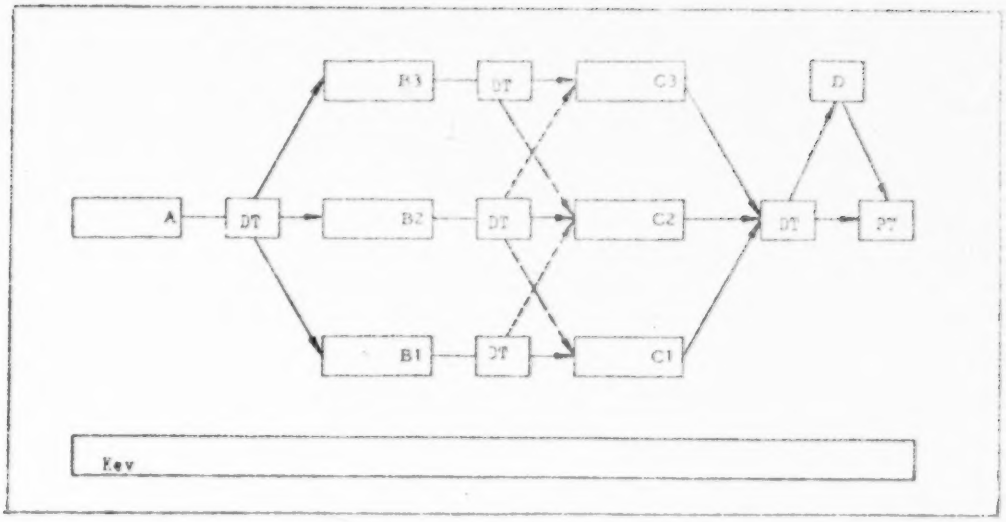
Öreberg, C. (Ed.) IMU-projektet: Målbeskrivningar för ett självinstruerande studiematerial i matematik för grundskolans högstadium. Pedagogisk-psykologiska problem, No. 43a, b, 1966.

"IMU Upper Level" - A Description of the IMU Material

Version 3 of IMU Upper Level is the version that has been tested in the investigation of effects.

The principle behind the model for IMU Upper Level is that there should be no grade differentiation and no division into general and special courses. Instead the material is built up of nine units, known as modules, which together cover the upper level course in mathematics. Starting with a common curriculum for all pupils, the subject material is then structured according to the degree of difficulty within each module. Box 2 outlines the principles on which a module is based.

Box 2. Diagram showing principles of a module in IMU Upper Level - version 3.



Each module comprises four parts, components, the first three of which belong to the basic course. They are called components A, B and C. Component A is common for all pupils. The B and C components are divided into levels of difficulty, hereafter called booklets. For the B component there are 2 or 3 booklets, called B1, B2, B3 or B1, B2-3. The C component comprises 3 booklets, C1, C2 and C3. The degree of difficulty is lowest in the B1 and C1 booklets, while B2-3 or B3 and C3 are the most difficult. The different booklets cover roughly the same material, but the way in which the instructions are presented and the number of extra tasks vary. The D component is not part of the basic course. It exists only on one level and comprises both revision tasks and certain tasks of a more independent nature. Each component except the D component is completed with a diagnostic test. The number of tasks in this test varies depending on which booklet has been studied within the component. As a rule the number of tasks is greater for the more difficult booklets. Each component also includes diagnostic tasks that the pupils correct themselves. Each module finishes with a prognostic test which exists in three parallel variations.

The material is individualized in both the rate of work and the degree of penetration. As a result pupils within one grade can reach different points in the material. The intended "normal rate of study" is three modules per year.

In principle the pupils are free to choose which booklet they like. The idea is that the pupils should together with their teacher go through what they have achieved earlier and on the basis of this and other experiences choose a suitable level. It is possible and permissable to change level both within and be-

tween modules. The constructors of the material have indicated certain figures for guiding the spread between the different levels in a component, but neither pupils nor teachers are obliged to follow these figures.

One of the starting points for the construction of IMU Upper Level has been the project's goal descriptions for a self-instructional study material in mathematics for the upper level of the comprehensive school (cf. above). This goal description comprises 17 areas of material, containing a total of 208 items. The areas are divided into two goal levels: knowledge and proficiency. In the majority of cases the 208 items have been divided into further behavioral units, with the result that altogether the catalogue of goals lists about 700 goal behaviors. The goal description states what the pupils **should** know when they leave the upper level of the comprehensive school. In order to heighten the precision and communicability of the goals, the concepts expressed by the curriculum as "command", "understand", "be acquainted with", "know about" and "have insight into" have been replaced by terms such as "be able to give examples of", "be able to define", "be able to illustrate", "be able to construct", "be able to give an account of" and "be able to point out". The goal descriptions also include a collection of examples that express concretely the behaviors described verbally in the catalogue of goals. Together with this collection of examples and the study material, the goal description has provided the starting point for the construction of the terminal tests, which have been used to test the knowledge and proficiency of the pupils at the end of grade 9. The terminal tests comprise about 700 separate tasks.

The Investigation of Effects

The investigation of effects was planned during the school year 1967/68 and a preliminary plan was published in December 1968. It took up seven main points that were to be studied during the school years 1968/69 - 1970/71. Some changes have been made in this plan, but these have mainly consisted of transferring problems from one main area to another, some points have been expanded, others restricted. The only change of any importance concerned the main study in the investigation of effects, which was broken off after grade 8. There were several reasons for this, the most essential one being that the IMU pupils were studying according to the 1962 curriculum for the comprehensive school, though not as far as the course content was concerned, and were thereby part of a system that was to disappear after the school year 1970/71 when the curriculum of 1969 came into force. It was

thought that results from a school level with separate alternative lines would be very difficult to compare with an undifferentiated level.

On the basis of the seven main points in the preliminary plan, eight part-studies have been carried out. While the work of the project has been underway, a further two part-studies have been added. The results from the ten part-studies are reported in a total of eighteen reports. All have been published in the series Pedagogisk-psykologiska problem, nos. 65, 86 and 145, and nos. 185-199.

Main investigation

The results from the main investigation are presented in three reports (Larsson & Larsson, 1972; Larsson, 1972a, b). The first deals with the conditions for data analysis and relates the main investigation's populations, samples, measurements, measuring instruments, reliability tests, chosen methods of analysis and the accounting principles for later parts of the results. Certain organizational factors are also discussed, namely the changes in the organizational milieu that have taken place during the experimental period and the changes that have taken place in the composition of the teacher and assistant groups.

The second report (Larsson, 1972a) presents the results from the main investigation's pupil study. The account is based on three main types of question:

a) How important are characteristics of the pupils themselves?
b) How important are characteristics in the pupils' milieu?
c) How important are characteristics of the pupils' teachers?

These questions are regarded from the point of view of the pupils' knowledge and proficiency in mathematics, their general attitudes towards school and towards mathematics, their attitudes towards other school subjects, their attitudes towards the IMU material, the IMU method, the content of the IMU course and to IMU in general.

The third report (Larsson, 1972b) presents the results of the main investigation's teacher and assistant study. The account of the teacher study is based on two main types of question:

a) How important are characteristics of the teachers themselves?
b) How important are characteristics in the teachers' milieu?

These questions are considered from the point of view of the teachers' distribution of working time between different tasks during and outside lessons in connection with IMU teaching and of their attitudes towards the different parts of the IMU system and the changes that teaching with IMU can bring about both for themselves and for the pupils.

The account of the assistant study is based on the following main type of question:

How important is the organizational milieu in which the assistants work for their tasks during and outside lessons in IMU teaching?

Goal testing study

The results from the goal testing study are reported in Hellström (1972b). In the introduction and conclusion of the report, some of the problems associated with the use of criteria-related tests are discussed, together with the procedures that have been used in constructing the terminal tests, which are based upon the goal descriptions of the IMU project. The account of the results from the terminal tests is based on three main types of question:

a) What is the total level of the pupils' knowledge and proficiency within the areas defined in the goal descriptions of the IMU project?
b) How important are characteristics of the pupils themselves with regard to knowledge and proficiency as defined in (a)?
c) How important are characteristics in the pupils' milieu in the same respect?

Material study

The results from the material study are described in two reports (Larsson, 1972c; Davidsson, 1972). The former gives the results for grades 7 and 8, the latter for grade 9. The reports give accounts of the pupils' results in diagnostic tests and prognostic tests, together with their opinions on the different booklets and individual items in the booklets. In addition, figures are given for the amount of time used for each booklet and module, the working speed in relation to achievement, the results of the prognostic tests in relation to the level of difficulty the pupils' choices and routes taken through the IMU material's nine modules, together with some data on how far the different variations of the prognostic tests are parallel.

Job analysis study

The results of the job analysis study are presented in two reports (Alehammar & Klasson, 1972a, b). The former gives job descriptions for principals, heads of department, teachers and assistants and is based on the general question of what tasks and situations have faced those holding these posts in their work with IMU teaching. The latter presents the results of a questionnaire study carried out on heads of department, teachers and assistants and is based on two main types of question:

a) How important are characteristics of the job-holders themselves?
b) How important are characteristics in the job-holders' milieu?

These questions are put with reference to the tasks they are faced with in IMU teaching, the actual and desired relative amount of work needed for each task, the opportunities given for cooperation, the difficulties involved in dealing with the respective tasks and the stimulus given by the respective tasks.

Parent study

The results of the parent study are reported in Larsson (1972d). The parents' knowledge of IMU and the new mathematics is described, together with their attitudes towards individualization and the different organizational models. The report also gives an account of the extent to which the parents may and can help their children with their mathematics and of their attitude towards the school their children attend compared to the school they once went to themselves. The parents' answers are related to certain characteristics of the children and to the type of class the children are in.

Observation study

The results of the observation study are reported in Martinsson (1972). An account is given of some observation studies carried out both in classes working with IMU and in classes working in a conventional way. Some organizational models with high frequencies have been studied and the results are discussed in relation to one main type of question:
How important are different organizational models for the tasks of the teachers, assistants and pupils during the lesson?
The models that have been studied are some three-class models, one two-class model and the one-class model. In addition comparisons are made with some control classes having conventional teaching.

Study of anxious pupils

The results of the study made of the problems of anxious pupils are presented in Petterson (1972). The report comprises two part-studies. The first attempts to investigate possible connections between on the one hand school motivation and anxiety and on the other sex and achievement variables. The development of both IMU pupils and control pupils has been studied during a period of two years. The second part-study aims at examining possible connections between the ability to see logical connections between numerical exercises and test anxiety, school motivation and attitudes towards mathematics in grades 3, 6 and 9. The second part comprises pupils who do not work with IMU.

Studies of different ways of presentation

The studies that have been carried out on different ways of presenting mathematical material are presented in three reports (Berglund & Jivén, 1968; Berglund & Jivén, 1969; Jivén, 1971). They have all three been conducted on groups of pupils other than those included in the investigation of effects. Two main types of problem have been dealt with: the effect of the size of the step in the presentation of mathematical material, both when a teaching machine is used and in a "normal" textbook, and comparisons between visual and auditive presentation of mathematical material. In the first two studies, pupils from remedial classes in grades 5, 6 and 7 have participated, and in the third, pupils from reading classes in grades 4 and 6, from remedial classes in grades 5 and 6 and from normal classes in grade 7.

The work of project consultants within the IMU project

The work of the project consultants is reported in Olsson (1972a). The report consists of a collection of notes on general experiences of working as a project consultant and accounts of impressions from the various visits made to schools by the project consultants during the years 1969-1971.

Study of "single" pupils

(Pupils who have moved from a school using IMU in mathematics teaching to a school that does not have IMU and are allowed to continue working with IMU alone in the new class, are here called "single" pupils.) The results of the study of single pupils are presented in Olsson (1972b). The report discusses the problems of these pupils and the routines that have been developed by the project consultants for solving them both for the pupil and for the new teacher. The report also presents the results from questionnaires given to single pupils in grades 7, 8 and 9 and to the teachers of these pupils.

Summaries

In report 199 is given a summary and a discussion of the results from the ten part-studies within the investigation of effects. The results are discussed from the point of view of factors that distinguishes the IMU system from other learning material in mathematics: The method, the material and the organization. - Two summarizing books should also be mentioned. In one of them (Larsson, 1973a) various aspects of the project are discussed. The other (Larsson, 1973b) is a translation into English of report no. 199 with some extensions.

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INSTRUCTIONAL METHODS IN GERMAN

Contacts: Horst Löfgren, Ebbe Lindell

Main aims

The main aims of the project are 1) scientifically to investigate certain prerequisites for and different methodological approaches in teaching German to students in the Swedish comprehensive school and, (2) in the light of this investigation and with the aid of successive trials and revisions, to construct a study material system for teaching German to beginners.

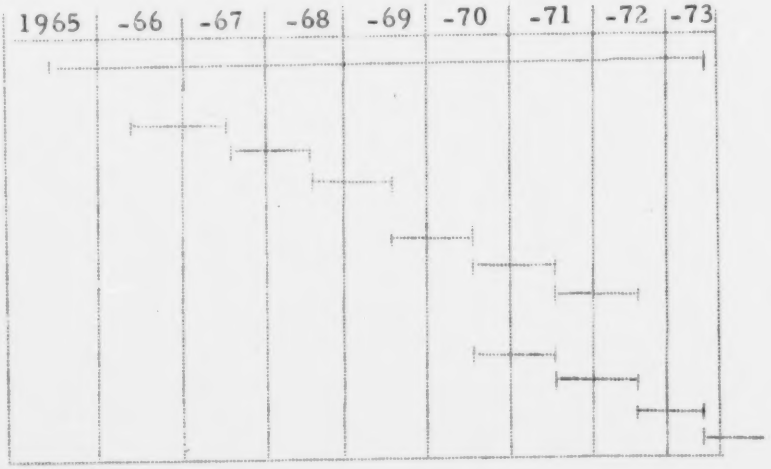
Plan

The research and production of study material carried out in the UMT project (UMT is an abbreviation of the Swedish title "Undervisningsmetodik i tyska" = "Instructional methods in German") has been made possible by cooperation between research workers in education, language experts, methodologists, writers, publishers, teachers and students. The research and writer group converts the results of the basic research intc general principles for the production and construction of study material. This material is tested and the amount of revision that follows depends upon the achievements of the students and the other reactions from them and their teachers.

The work of the UMT project can be divided into the following four main phases:

1. Analysis of educational prerequisites: Goal, student and material analyses.
2. Analysis of educational process with experiments in teaching methodology.
3. Analysis of educational product with different kinds of testings.
4. Production of study material according to the results obtained by means of points 1-3.

Timetable



1. Analyses of prerequisites

1.1 Goal analyses

1.1.1 Analyses of expert opinions. Includes studies of the grammatical content and the factual areas represented in the most common textbooks in German. The degree of agreement is established by means of analyses of content. The first studies of this kind were intended to produce starting points for methodological experiments.

Lindell, E. (Ed.) Språkprojektet "Tyska 7" läsåret 1965-66: I. Målen för undervisningen. /The language project 'German, 7'. School year 1965-66: Aims of language education./ Pedagogisk-psykologiska problem, No. 35, 1966.

Schwandt, E. Innehållsanalyser av läroböcker i tyska för grundskolans årskurs 8. /Contents analyses of text-books in German for grade 8 of Swedish comprehensive school./ Pedagogisk-psykologiska problem, No. 66, 1968.

Schwandt, E. Frekvensundersökning av de finita verbformerna i några läroböcker i tyska för grundskolans åk 8. /Frequency study of the finite verb forms in some German textbooks for grade 8 of comprehensive school./ Stencil, 1968.

1.1.2 Consumer studies. One study has been carried out for the purpose of investigating the occurence of the German language within Swedish trade and industry, in order to obtain profiles of the four language activities, understand spoken German, speaking German, writing German and reading German. - The general principles for a study of needs and occurrence of the German language in private life have been drawn up and the study is underway.

Larsson, I. Tyska språket i delar av svenskt näringsliv: En studie i enkätmetodik och en undersökning av språkbehoven. /The German language in Swedish commercial and industrial life: A study in questionnaire technique and a research on the necessity of mastering the language./ Pedagogisk-psykologiska problem, No. 101, 1969.

1.1.3 Tolerance studies. These are intended to reveal the degree of perfection necessary in different types of linguistic skills in various consumer contexts. Is perhaps the need for perfection exaggerated at school and the need for speed underestimated? - At the present moment work is being done on some material in which German school students have been asked to rewrite Swedish students' incorrect German constructions. In this way it is possible to find out which types of mistake lead to a failure in communication and which types can be tolerated.

Engh, B. En toleransundersökning: Tyska elever tolkar svenska elevers språkfel. /A tolerance study: German pupils "interpret" linguistic errors made by Swedish pupils./ Pedagogisk-psykologiska problem, No. 137, 1971.

Teschner, W. -P. Toleranzuntersuchung der Lehrerhochschule Malmö in Zusammenarbeit mit der Gesamtschule BBR. /Tolerance study in cooperation between Malmö School of Education and a German Comprehensive School./ Berliner Lehrerzeitung, 1969, 23, 16-17.

Teschner, W. -P. Toleranzuntersuchung der Lehrerhochschule Malmö in Zusammenarbeit mit der Gesamtschule BBR. /Tolerance study in cooperation between Malmö School of Education and a German Comprehensive School./ Didakometrie und Soziometrie, No. 8, 1970.

1.2 Student analyses

Analyses of mistakes. Here the types and frequencies of the mistakes in the students' written and oral work have been studied. In order to map the problems that Swedish students have in pronouncing German, a comparison has been made between the German and Swedish systems of phonemes, and the pronunciation by a few students of German fricatives and affricates has been analysed.

Engh, B. Feltyper och felfrekvenser i en grupp gymnasieelevers skriftliga prestationer i ämnet tyska. /A frequency study of the types of errors made in written German by a group of Swedish pupils./Pedagogisk-psykologiska problem, No. 57, 1968.

Engh, B. Feltyper och felfrekvenser i årskurs 9 vid fri skriftlig produktion i tyska. /A frequency study of the types of errors made in written German by pupils in grade 9 of the Swedish comprehensive school./ Pedagogisk-psykologiska problem, No. 72, 1968.

Kitzing, K. Några malmöelevers uttal av tyska spiranter och affrikator. /Some Malmö pupils' pronunciation of German fricatives and affricates./ Pedagogisk-psykologiska problem, No. 49, 1967.

Petersson, L. Några elever talar tyska: Feltyper och felfrekvenser i årskurs 9. /Some pupils speak German: A frequency study of the types of errors made by pupils in grade 9 of the Swedish comprehensive school./ Pedagogisk-psykologiska problem, No. 141, 1971.

1.2.2 General student prerequisites. Here an attempt has been made to study more general student attributes that can be of significance for the teaching of a foreign language to beginners, such as intelligence, verbal ability, auditive ability and previous knowledge.

Lindell, E. (Ed.) Språkprojektet "tyska 7" läsåret 1965-66: II. Ele - förutsättningar och teknisk utrustning. /The language project "German, 7". School year 1965-66: Pupil qualifications and technical aids./ Pedagogisk-psykologiska problem, No. 37, 1966.

1.3 Material analyses

1.3.1 Studies of structure frequencies. A study of frequent linguistic structures in German newspaper texts was completed during 1971/72. A final report is underway and it is calculated that it will be finished during 1973. The analyses can be summarized as follows:

1. The number of letters/words (average number and distribution, plus frequency table)
2. The number of words/sentence (average number and distribution, plus frequency table)
3. Alphabetic word list, distinguishing homographs
   Ex. 7 DER/AFDS (=article, fem., dative, sing.)
   11 DER/AMOS (=article, masc., nom., sing.)
   1 DER/PMOSR (=rel.pron., masc., nom., sing.)
4. Clause analysis
   4.1 The frequency of the different parts of the sentence divided between
      4.1.1 Gender, case, number
      4.1.2 Tense, person, number, mood, main form
   4.2 The structure of the different parts of the sentence (sequence). (The frequencies are fictitious)
      Ex. 70 A /ADS (=article+adjective+noun)
      60 A /AS (=article+noun)
      100 A /P (=pronoun)
   4.3 Governing words distributed over parts of sentences and sequences
      Ex. MIT/HFDS/RPS (=adv. of manner, fem., dat., sing./prep.+pron.+noun)
      AUF+LIEGEN/FMDS/RAS (=adv. of place, masc., dat., sing./prep.+art.+noun)
   4.4 Sum totals for
      4.4.1 case, gender, number, type of pronoun
      4.4.2 tense, person, mood, main form
      4.4.3 main clause and subordinate clause, plus word order
   4.5 Total structure of the sentences (word class and part of sentence)
      The number of sentences with identical structure is added up.

Nilsson, B. Strukturfrekvenser i tyskt tidningsspråk ("Bildzeitung"): Metodkonstruktion och några förstudier. /A study of grammatical structure frequencies in modern journalistic German ("Bildzeitung"): Method construction and pilot studies./ Pedagogisk-psykologiska problem, No. 88, 1969.

Lindell, E. & Nilsson, B. Strukturfrekvenser i tyskt tidningsspråk: En analys av ett antal nummer av "Bildzeitung". S. Allén & J. Thavenius (Ed.) Språklig databehandling. /Structure frequencies in newspaper German. An analysis of a number of editions of "Bildzeitung". S. Allén & J. Thavenius (Ed.) Linguistic data processing./Lund: Studentlitteratur, 1970. Pp. 115-137.

1.3.2 Contrast studies. Within this branch of the material analyses, we have presented a comparison of word order in German and Swedish.

Grunewald, G. En studie av ordföljden i tyska och svenska. /A study of word-order in German and Swedish./ Pedagogisk-psykologiska problem, No. 59, 1968.

1.4 Summary

The results of research into language frequencies, types of mistakes made by the students, the tolerance of the recipient and the consumers' need of activities have been integrated in the following book:

Lindell, E. Mål i språk. /Objectives in modern languages./ (Pedagogisk orientering och debatt, No. 41.) Lund: Gleerups, 1972.

2. Analysis of educational process

2.1 Methodological experiments

2.1.1 With or without text? Is it correct that the early introduction of text (in the foreign language) into the teaching of beginners disturbs the learning process, or can the text in a language that is relatively uniform from the point of view of phonetics and spelling like German reinforce the learning? Experiments have been carried out with beginners, both with and without text.

Lindell, E. (Ed.) Med eller utan text? Empirisk belysning av en stridsfråga beträffande nybörjarundervisning i främmande språk. /With or without text? Empirical evidence concerning a controversial issue within the first training of a foreign language./ Pedagogisk-psykologiska problem, No. 41, 1966.

2.1.2 Testing of series of lessons with varying combinations of grammatical exercises and language laboratory practice. Experiments have been conducted to investigate whether summaries in the form of grammatical paradigms are unnecessary distractions or valuable short-cuts. Further various forms of working in the language laboratory have been tested and various forms of combining classroom teaching and teaching in the language laboratory. Both AA and AAC studios have been used in the experiments.

Lindell, E. (Ed.) Två språkpedagogiska metodförsök: I. Arbetsformer i språklaboratorium. II. Försök med en gammal paradigm. /Two experiments of method within language instruction: I. Methods of work in the language laboratory. II. Experiment with an old paradigm./ Pedagogisk-psykologiska problem, No. 44, 1966.

Lindell, E. (Ed.) Kombination av språklaboratorieövningar och klassrumsundervisning. /Combination of language laboratory drills and classroom instruction./ Pedagogisk-psykologiska problem, No. 46, 1967.

Lindell, E. (Ed.) Kombination av språklaboratorieövningar och klassrumsundervisning, ett parallellförsök. /Combination of language laboratory drills and classroom instruction, a parallel experiment./ Pedagogisk-psykologiska problem, No. 50, 1967.

Löfgren, H. (Ed.) Kombination av klassrumsundervisning och övningar av språklaboratorietyp: Exempel på första utprövning av en undervisningsenhet. /Combination of classroom instruction and exercises of language laboratory type: Example of a first try-out an instructional sequence./ Pedagogisk-psykologiska problem, No. 52, 1967.

Lindell, E. (Ed.) Ett försök med självinstruerande material i språklaboratorium och i skriftlig programmering. /An experiment with self-instructing material in the language laboratory and in written programs./ Pedagogisk-psykologiska problem, No. 53, 1967.

2.1.3 Swedish translations in the word lists or not? Proceeding via Swedish can be thought to imply both to speed up understanding of new words and to interfere with the process by which the students grow accustomed to thinking and speaking directly in the foreign language. Do the advantages or the disadvantages weigh heaviest, and is it possible to achieve a compromise that could lead to increased efficeincy? - A number of minor studies have been carried out concerning the effect of different ways of learning words, such as one-language word lists, two-language word lists, illustrated word-lists and various combined methods.

Löfgren, H. Försök med en- och tvåspråkiga ordlistor. /Experiments in the use of monolingual vs. bilingual glossaries./ Pedagogisk-psykologiska problem, No. 29, 1966.

Löfgren, H. Försök med två olika typer av ordlistor. /Experiments on two different types of glossaries./ Pedagogisk-psykologiska problem, No. 62, 1968.

Hall, P. Ett försök med bildordlista. /The role of pictures in the learning of new words: An experiment concerning three types of glossaries./ Pedagogisk-psykologiska problem, No. 78, 1969.

2.2 Questionnaire studies

2.2.1 Teacher experiences. In order to find out the attitude of teachers towards a number of topical problems mainly within the methodological area, a questionnaire study has been conducted on teachers in the upper level of the basic school.

Hall, P. Hundra språklärares erfarenheter: Enkät om undervisningsmetodiken i främmande språk på grundskolans högstadium. /The experiences of one hundred teachers of foreign languages: A questionnaire about the methodology of teaching foreign languages at the senior stage of the comprehensive school./ Pedagogisk-psykologiska problem, No. 97, 1969.

Hall, P. Första årets tyska: Elev- och lärarattityder till UMT-projektets läromedel. /The first year of studying the German language: Pupils' and teachers' attitudes towards study materials, constructed by the UMT-project./ Pedagogisk-psykologiska problem, No. 130, 1971.

2.2.2 Student experiences. Studies of student attitudes have been carried out in the upper level of the basic school and the gymnasium.

Lindell, E. (Ed.) Elevattityder mot olika arbetssätt i tyska. /Pupils' attitudes towards different ways of working during German lessons./ Pedagogisk-psykologiska problem, No. 58, 1968.

Magnusson, Gerd, Elevattityder mot nytta och nöje av olika arbetssätt i språkundervisningen. /Pupil attitudes to the pleasure and usefulness of different working methods in the teaching of languages./ Manuscript, 1968.

Hall, P. Elevers erfarenheter av undervisningen i främmande språk: En enkätstudie i grundskola och gymnasium. /Swedish pupils' experiences of learning foreign languages: A questionnaire for grade 9 and grade 12./ Pedagogisk-psykologiska problem, No. 117, 1970.

2.3 Teaching with the help of teacher assistants

During the school years 1968/69 and 1969/70, experiments have been carried out into changing the school organization, whereby teacher assistants have participated in German lessons in grades 7 and 8. This part-study has been reported together with an investigation of effects in grade 7 (see below).

2.4 Summary

Lindell, E. Främmande språk i grundskolan: Metodförsök, lärarerfarenheter och elevattityder. /Foreign languages in comprehensive school: Methodological experiments, teachers' experiences and pupil attitudes./(Pedagogisk orientering och debatt, No. 34.) Lund: Gleerups, 1971.

3. Analysis of educational product

3.1 Measurements of the students' skills in German

Studies have been conducted that have been aimed at contributing to our understanding of how language skills are built up and how they can be measured as comprehensively as possible. Analyses of language skills have been carried out in grades 7 and 9.

Löfgren, H. Measuring proficiency in the German language: A study of pupils in grade seven. Didakometry, No. 25, 1969.

Löfgren, H. Mätningar av språkfärdighet i tyska: En undersökning på elever i årskurs 9. /Measuring proficiency in the German language: A study of pupils in grade 9./ Pedagogisk-psykologiska problem, No. 158, 1972.

Löfgren, H. Mätningar av språkfärdighet: En hypotesprövande undersökning av en faktorstruktur. /Measuring language proficiency: A study testing hypotheses concerning a factor structure./ Pedagogisk-psykologiska problem, No, 161, 1972.

Löfgren, H. Mätningar av språkfärdighet i tyska: Testbatteri och testdata. /Measuring proficiency in the German language: Test battery and test-data./ Testkonstruktion och testdata, No, 4, 1969.

Löfgren, H. Mätningar av språkfärdighet i tyska: Testbatteri och testdata åk 9. /Measuring proficiency in the German language: Test battery and test-data grade 9./ Testkonstruktion och testdata, No. 14, 1972.

Löfgren, H. The measurement of language proficiency. Studia psychologica et pædagogica, No. 17, 1972.

3.2 Development of pronunciation

After comparing the phoneme systems of German and Swedish, the pronunciation of some Malmö students of German fricatives and affricates has been studied. A study has also been made of phonetic mistakes made during one year of German teaching.

Kitzing, K. Några malmöelevers uttal av tyska spiranter och affrikator. /Some Malmö pupils' pronunciation of German fricatives and affricates./ Pedagogisk-psykologiska problem, No. 49, 1967.

Nauclér, K. Nybörjarundervisning i tyska: Några uttalsproblem. /First-year course in German: Some problems in pronunciation./ Pedagogisk-psykologiska problem, No. 109, 1970.

3.3 First year German: An analysis of educational product

Investigations of effect have been carried out for the UMT material in grades 7 and 8. The main problem in these studies has been to see the results produced by teaching with the UMT study material compared to other material being used in the same grade. The study conducted in grade 7 has been reported and the one for grade 8 is underway. In the grade 7 report a description is also given of how much the students know after one year's teaching in German in both the basic and advanced courses. In addition the problem of organizational models in the teaching is discussed, together with a little on the effects of the teacher's influence compared to that of the study material.

Löfgren, H. Effektmätning av UMT-projektets undervisningssystem "Deutsch". /Measuring the effect of the UMT project's teaching system "Deutsch"./ Pedagogisk-psykologiska problem, No. 159, 1972.

3.4 First year German: Student and teacher questionnaires within UMT

The UMT material has also been evaluated both with regard to the general impression of the material and to the different types of exercises used.

Hall, P. Första årets tyska: Elev- och lärarattityder till UMT-projektets läromedel. /The first year of studying the German language: Pupils' and teachers' attitudes towards study materials, constructed by the UMT-project./ Pedagogisk-psykologiska problem, No. 130, 1971.

4. Construction and testing of study material

4.1 Survey of principles followed in producing the study material

A compressed description has been given of the UMT project's planning of and concrete work on the production of the study material.

Lindell, E. Läromedelssystem för undervisning i främmande språk: Principöversikt och exempel. /A system of study materials for foreign language training: principles and examples./ Pedagogisk-psykologiska problem, No. 73, 1968.

4.2 Working with a teaching system

While the previous description dealt with planning and construction work, this account gives direct examples from the finished teaching system with its varying types of exercise, study material and diagnostic tests. Some of the results of the testings are also given, with regard both to achievements and attitudes.

Lindell, E. (Ed.) Att arbeta med ett undervisningssystem: En presentation av UMT-projektets läromedel. /Working with a teaching system: A presentation of the UMT project's study materials./ Pedagogisk-psykologiska problem, No. 106, 1970.

STUDIES OF FACTORS THAT AFFECT CONCEPT FORMATION AND CONCEPT LEARNING IN TEACHING SITUATIONS

Contacts: Ingvar Werdelin, Gunnel Stjernberg

Main aims

Central problems concerning concept formation and concept learning have been investigated. The following main areas have been studied:

1. The dependence of concept forming on the concrete material (field studies).
2. The importance of means of presentation for concept forming and learning: the "discovery" method, transfer, "concept generalization", the pregnancy of the material, multi-sensory presentation etc. (field experiments and experiments).
3. The automatization process (field experiments and experiments).
4. Different methods of measuring attitudes.
5. Factors that affect the problem solving process (field experiments).

Many different types of problem belong under the heading "concept formation", problems ranging from simple classification of perceived objects to problem solving. In general this project has only taken up complex concept formation of the kind that Gagné names "concept learning", "principle learning" and "problem solving". A further specification is made by the fact that the project deals only with concept formation in educational situations.

Execution

The following part-studies have been carried out or started within the project:

A. Studies of the importance of concrete material in the teaching of mathematics. Three studies have been carried out, one by Agneta Follin and Gunilla Fredlund in cooperation with I. Werdelin on the importance of the concrete material for the learning of the concept "negative numbers" in grade 4, one by Ann Martinsson comprising a comparison between concrete material and pictorial material in a long-term experiment in mathematics in grade 4, and one by Anna-Lena Pettersson and others concerning age differences as to the importance of concrete material in mathematics teaching.

B. Studies of the importance of the "discovery" method for concept formation. A number of studies have been conducted. I. Werdelin, Barbro Tropé, Kristina Sjöberg and others have studied the effects of the "rule" method and the "discovery" method in different situations, Wiweka Havander has studied the effects of different amounts of instruction when teaching with the two methods, and I. Werdelin, Eva Bondesson and Gun-Britt Larsson have studied the transfer value of the methods. Barbro Tropé has carried out a long-term experiment with the "discovery" method and the "rule" method in the teaching of mathematics in grade 7.

C. Studies of the automatization process. Three studies have been conducted by I. Werdelin and Gunnel Stjernberg. The first concerns the nature of the perceptual factor P, the second the connection between test difficulty and factor loading and the third age differences between factor structures.

D. Studies of methods of measuring attitudes. Two fields have been dealt with in the studies. I. Werdelin has studied the factor structure of questionnaires and together with Hillevi Gellerstam and others the properties of objective attitude tests.

E. Studies of the effects of the abstractness of concepts in problem solving. A study has been carried out by I. Werdelin, B. Persson and K. Wimo.

F. Studies of development of concepts in small children. A study has been made by Birgitta Svensson.

(The project leader is Ingvar Werdelin, who has also taken the initiative in starting the project. During his absence when working for UNESCO in Beirut, Ann Martinsson, Barbro Tropé and Gunnel Stjernberg continued the work of the project at the Malmö School of Education.)

The project has received financial support from the Swedish Council for Social Science Research.

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(In this list only those reports and papers are given that are available from the Malmö School of Education.)

Martinsson, A. En jämförelse mellan två olika konkretionsgrader vid inlärandet av nya begrepp inom matematiken. /A comparison between two different degrees of concreteness in the learning of new concepts in mathematics./ Pedagogisk-psykologiska problem, No. 133, 1971.

Persson, B., Werdelin, I. & Wimo, K. Experimental studies of abstract and concrete concepts in problem solving. Didakometry, No. 19, 1968.

Sjöberg, K. & Tropé, B. The value of external direction and individual discovery in learning situations: The learning of a grammatical rule. Scand. J. educ. Res., 1969, 4, 233-240.

Svensson, B. Prediktionsinstrument i matematik för nybörjare och utvecklingstest i matematik för barn i årskurs 1. /Prediction instruments in mathematics for beginners and development tests in mathematics for children in grade 1./ Pedagogisk-psykologiska problem, No. 69, 1968.

Tropé, B. Undersökningar av effekten på begreppsinlärning vid olika typer av instruktion. /Studies of different types of instruction and their effects on concept learning./ Pedagogisk-psykologiska problem, No. 134, 1971.

Werdelin, I. Factor analysis of a questionnaire of attitudes towards school work. Educational and Psychological Interactions, No. 19, 1967.

Werdelin, I. Factor analyses of questionnaires of attitudes towards school work. Scand. J. Psychol., 1968, 9, 117-128. (a)

Werdelin, I. The value of external direction and individual discovery in learning situations: The learning of a mathematical principle. Scand. J. Psychol., 1968, 9, 241-247. (b)

Werdelin, I. The value of external direction and individual discovery in learning situations: The learning of a foreign alphabet. Scand. J. Psychol., 1968, 9, 248-251. (c)

Werdelin, I., Bondesson, E. & Larsson, G. B. The effectiveness and transfer value of two methods of concept learning. Scand. J. Psychol., 1971, 12, 198-204.

Werdelin, I. & Stjernberg, G. On the nature of the perceptual speed factor. Scand. J. Psychol., 1969, 10, 185-192.

Werdelin, I. & Stjernberg, G. The relationship between difficulty and factor loadings of some visual-perceptual tests. Scand. J. Psychol., 1971, 12, 21-28.

VOCATIONAL TRAINING PROBLEMS (the Y project)

Contacts: Lars Sjödahl, Bernt Larsson

Background and aims

A research project called Vocational Training Problems (the Y project) has been underway at the Malmö School of Education since the autumn of 1969. The resources have been concentrated on the nursing sector, the main aim being to construct a method-material system for the basic training of nurses. The work has been restricted to such professional demands as are connected with understanding the psychological needs and total situation of the patient.

Goals of the project

The more immediate goals of the project are shown briefly in the following plan of work:

1. Limited job analysis of the nurse's tasks. The results from this type of job analysis provide an empirical basis for goalseeking and goal formulation. Further, a job description facilitates the selection of a representative sample of practice cases for the method-material system we intend to construct and of items for the measuring instruments named under points 3 and 4 below. A content analysis of the curriculum for basic nursing training is naturally also of interest in this context.
2. Construction of practice cases that describe problem situations which demand an understanding of the psychological needs and total situation of the patient.
3. Construction and standardization of assessment instruments to be included in the method-material system.
4. Construction of attitude instruments intended to measure the degree of patient-centering.
5. Testing and revision of method-material system.
6. Investigation of effect using control groups, in which standardized practice cases and attitude scales are used as measuring instruments.

Examples of work carried out hitherto

Curriculum analysis

The curriculum analysis mentioned under point 1 above has been carried out by two independent analysers and is presented in a report under the heading "Analysis of curriculum for the basic training of nurses" (Sjödahl, 1971). The purpose of the curriculum analysis was to extract from the curriculum for nurses (1966) such expressions as can be regarded as concerning the goal aspect with which the Y project is working. The main principles by which sentences or expressions were to be selected were that sentences or expressions should only be noted if the demand concerned one or more of the following areas.

- the psychological needs or psychological reactions of the patient
- the social interplay in the actual nursing situation
- the total situation of the patient, e.g. relationship with relatives, social background etc.

The analysis shows that the goal aspect is primarily represented in the subjects health and sick care, sociology and social medicine, psychology and education. Within the subject health and sick care the greatest number of expressions is to be found in the sub-section general health and sick care, while the lowest number is to be found in the sub-section operative and acute medical care. The goal aspect is little represented within the subject clinical and social-medical training. With a slight exaggeration it could be said that the curriculum analysis suggests that the closer one comes to the practical side, i.e. the concrete reality, the more reluctant the curriculum is to say anything about the psychological aspect of the care. A large number of the expressions extracted can be found under the curriculum headings 'Directives and Comments' and 'Suggestions for disposition of syllabus'. The goal aspect is only modestly represented in the goal descriptions, however, which is presumably due to insufficient empirical goal seeking and to the difficulty of formulating the goals in terms of concrete behavior.

Limited job analysis

Since a very large proportion of the patients at a hospital are to be found in the medical and surgical wards and since we are obliged for practical reasons to limit the range of the job analysis, we have only approached medical and surgical clinics. A total of 170 nurses have been interviewed by means of the critical-incident method. We have collected descriptions of triggering incidents, course of events, possible alternative courses of action and conceivable consequences of proposed or actual measures. Categorization and processing of

this material is in hand, and the results will be reported in the form of suggestions for goal descriptions and curriculum design.

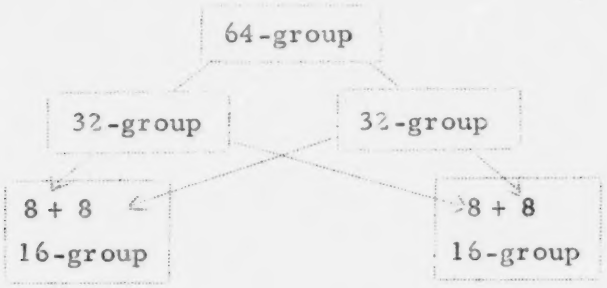
Construction of attitude scales and attitude measurement

We have assumed that there exist among the nursing staff attitudes that might possibly counteract or balance the trend for nursing to become depersonalized, which can easily follow as a negative consequence of certain efforts to rationalize in modern medical care. We have chosen to give these attitudes the comprehensive name, patient-centering. Taking as a starting-point literature and source material that can be assumed to reflect attitudes and outlooks towards the side of nursing that we are interested in, a list of items containing 175 statements has been constructed.

When placing these attitude statements along an 11-point scale, we have examined the studies that are usually quoted in methodological literature where general advice concerning the size of the assessor group is formulated. The most common method has been to correlate series of scale values obtained from groups of varying sizes. Another method has been to study main differences in scale values between different assessor groups. These methods are too coarse for the results to be of any particular interest. Correlations between series of scale values can no more provide a discriminating picture of what is known as sorter or assessor reliability than can a mean difference between the scale values of groups. Since the statements are chosen for the final scale in such a way that each interval along the scale is represented, it should also be of interest to know whether the assessor reliability is different for the different scale intervals. Further, the statements are chosen for the final version on the basis of the size of the interquartile range. Both the statement's interval position and its interquartile range should therefore be interesting dependent variables when varying the size of the assessor group.

In order to study how the size of the assessor group may influence the scaling results, we have divided our group of 64 assessors into two groups of 32. Further, two random samples of 16 assessors each have been taken withoug replacement from the two 32-groups, as shown in Fig. 3.

Figure 1. Survey of random sample procedure



Thereby we obtained the following five groups, the scaling results of which have been compared in different respects:

a total group of 64 assessors
two groups with 32 assessors in each group
two groups with 16 assessors in each group

The median value and interquartile range for each of the 175 statements that comprise the study have been calculated for all five assessor groups. If we rank these statements according to the size of the median values for each single assessor group, we thus obtain five ranking series. We have compared the structure of these series by calculating rank correlations (r_s) between the median series as shown in Tables 1 and 2.

Table 1. Rank correlations (r_s) between the 64-group's median series and the median series for the 32- and for the 16-groups.

	32_1-group	32_2-group	16_1-group	16_2-group
64-group	$r_s = 0,99$	$r_s = 0,99$	$r_s = 0,98$	$r_s = 0,98$

Table 2. Rank correlations (r_s) between the median series of the 32-groups and the median series of the 16-groups

Between 32-groups	Between 16-groups
$r_s = 0,97$	$r_s = 0,94$

All correlations must be considered very high. Thus the comparisons show that the relative ranking between the statements in this case are relatively independent of whether the assessor group comprises 64, 32 or 16 assessors.

Further, the statements have been ranked according to the size of the interquartile range for each single assessor group. Tables 3 and 4 show that the interquartile range is considerably more sensitive to variations in the size of the assessor group than the median value of the statements. For the 16-groups the correlation has sunk to 0,65, while the corresponding correlation for the scale values of the statements is 0,94.

Table 3. Rank correlations (r_s) between the 64 group's interquartile range series and the interquartile range series of the 32-groups and the 16-groups

	32_1-group	32_2-group	16_1-group	16_2-group
64-group	$r_s = 0,94$	$r_s = 0,94$	$r_s = 0,82$	$r_s = 0,88$

Table 4. Rank correlations (r_s) between the interquartile range series of the 32-groups and the 16-groups

Between 32-groups	Between 16-groups
$r_s = 0,82$	$r_s = 0,65$

It is obvious that correlations between series of scale values from assessor groups of varying sizes can be very high and that we can all the same risk obtaining essentially different selections of statements, depending on which group of assessors we follow, since the statements are selected for the final scale on the basis of their interquartile range.

In order to construct at least two parallel versions of the attitude scale, we have chosen on the basis of the scaling results 50 pairs of items in such a way that the statements within each pair of items are as close together as possible on the attitude continuum. The two scales were given in Likert form to 133 student nurses and the results have been factor analysed. The factor analysis gave data that made it possible to compare the following three methods for the selection of items for parallel tests:

$Pair_f$ = selection of pairs guided by the size and intra-pair difference of the loadings in the first unrotated factor.

R^2 = selection of individual statements guided by the size of the squared multiple correlations

$Pair_{R^2}$ = selection of pairs guided by the size and intra-pair difference of squared multiple correlations.

The comparisons show that selection guided by the squared multiple correlations (method R^2 and $Pair_{R^2}$) gave a better sample of statements from the point of view of representativeness than selection of pairs guided by the loadings in the first unrotated factor.

In both the factor analyses that have been carried out with the same sample of individuals but with a separate, matched sets of variables, the following seven factors have been isolated.

Factor 1
The factor's negative pole describes a somewhat formalistic and instrumental attitude towards more personal nursing duties, i.e. the nursing is felt to be a formal role or a means of satisfying interests, needs or expectations that are not directly connected with the psychological situation of the patient. Many of the variables that are included in the factor express a rational attitude towards the expressive, personal sides of nursing.

Factor 2
This factor captures something we could call a concrete, anti-intraceptive attitude or outlook. The variables that are included in the factor express a concrete, practical attitude, combined with insufficient readiness to accept or share the problems of others.

Factor 3
One of the factor's poles probably describes a dutiful and extrovert attitude towards the patient, while the other captures a tendency to avoid contacts with patients and responsibility.

Factor 4
This factor describes an attitude we would like to call tact and consideration, combined with an active interest in the patient as a person and not simply as a case.

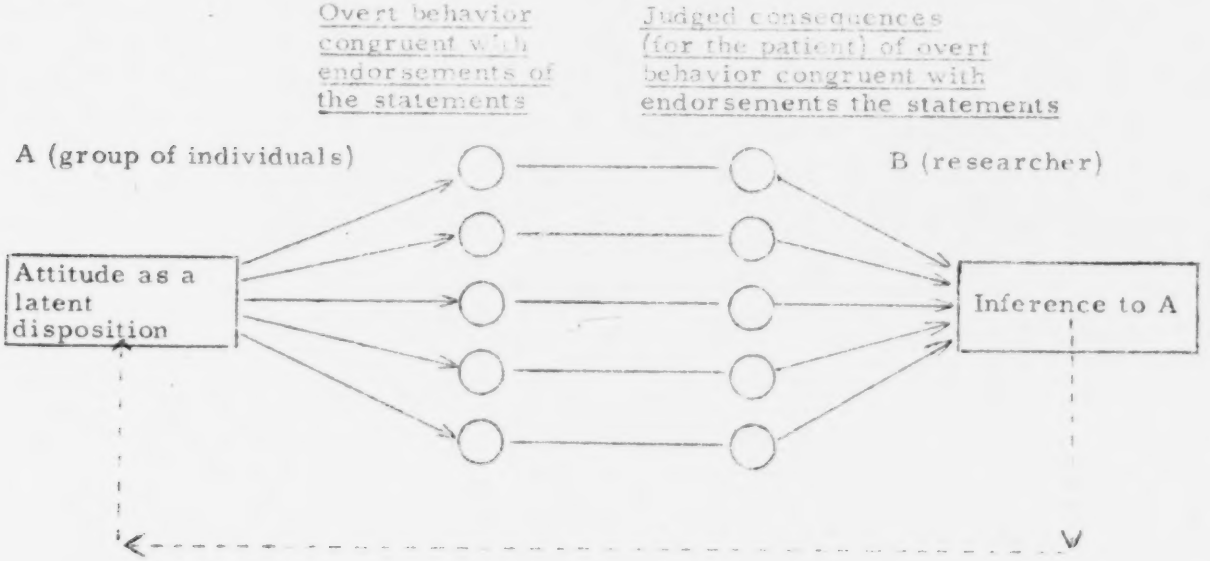
Factor 5
The factor describes an attitude in which the tendency is to gloss over and belittle the patient's psychological problems.

Factor 6
The negative pole of the factor describes a lack of readiness to enter into the role of the patient, while the positive pole can be interpreted as showing understanding and role identification.

Factor 7
This factor describes a tendency towards simplified generalizations and dependence on regulations, which gives little scope for individual considerations and nuances in social relationships. Many of the variables that are included in the factor express an attitude that implies falling back in a social context on simple rules and ready-made stereotyped solutions.

Interpretation of a rotated factor-matrix implies, in short, that the researcher, according to certain criteria, groups together those variables that are indicative of a factor, tells which characteristic is common only to those variables belonging to the factor and finally describes the psychological reality that the factor is supposed to represent. The researcher's interpretation thus includes both concept formation and intuitive inference. To facilitate the factor interpretation the following model of intuitive inference has been proposed and applied in both factor analyses.

Figure 2. Inference from overt to covert variables


Overt behavior congruent with endorsements of the statements
Judged consequences (for the patient) of overt behavior congruent with endorsements the statements
A (group of individuals)
B (researcher)
Attitude as a latent disposition
Inference to A

Two independent judges have quantified the consequences of overt behavior congruent with verbal endorsement of the attitude statements, and these measures have been used in comparing attitude items significantly loaded in the factor with items correlating about zero with the latent factor.

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COMPOSITION IN THE INTERMEDIATE STAGE OF THE COMPREHENSIVE SCHOOL (FRIS)

Contacts: Ann Martinsson, Ebbe Lindell

Aims

The aims of the project are to

A. find objective measurements of the quality of the writing
B. study the development of the students' achievements during the intermediate level (grades 4-6)
C. test different methods of stimulating the students' free writing
D. make comparisons between the language of children and adults
E. study prerequisites for the writing: intelligence, attitudes, interests, personality, creativity
F. study differences between different social environments

Timetable and methods

The project is following a group of students through the intermediate level. The work was started in the autumn term of 1970, when the students were in grade 4, and the collection of data was completed in the spring term of 1973, when they finished grade 6.

During the autumn term of grade 4 the first free writing task was given. A picture full of action was used as a stimulus, after which the composition was given the name "At the museum". Studies of the children's language provide us both with descriptions and with starting points for the seeking of objective measurements. The latter are validated by means of comparisons with different types of marks, in which the assessors have taken different aspects into account. The types of mistakes made are also mapped.

Qualities such as verbal intelligence, general ability and attitudes towards activities in writing were studied during the spring term of grade 4.

During the autumn term of grade 5 an experiment with different types of stimulus was carried out. When it was planned, we worked from the results of the study of attitudes made during the previous term.

A similar experiment was carried out during the spring term in grade 5. This time new types of stimulus were studied, but in addition the experiment was planned in such a way that the students' compositions could be compared with texts from children's books, on the same theme. On this occasion, too, questionnaires were given about the students' preferences in composition subjects.

The autumn term of grade 6 was occupied by a study of creativity with the help of tests produced by earlier research. The test results are also to be used as validation instruments for defining creative compositions.

A third experiment was included in the last term, now with what are considered to be particularly creative composition subjects. Finally a terminal free writing task was given, parallel to the initial one, this time with the picture and title "At the camping site".

Students participating

Sex/School	A SI 2.93	B SI 2.19	C SI 1.42	Total
Boys	36	32	29	97
Girls	37	24	33	94
Total	73	56	62	191

In the table SI stands for "social index". This is based on the class to which the parents belong according to a common Swedish classification and can vary between 4, when all belong to social group I (higher), and 1, when all belong to social group III (lower). The 191 pupils who make up the main sample of the project in the calculations have taken part in all data collections during the three years of the project.

Some results and details

The free writing produced on the subject "At the museum" is being subjected to a thorough linguistic analysis. The calculations that this in its turn leads to are being carried out by computer. The objective measurements that are calculated in this way are validated by means of comparisons between different assessments of the compositions as a whole.

The following examples of validity coefficients have been extracted from the first computer print-outs:

Some linguistic measurements as assessments of quality

Measurements	Mean value	Correlation with criterion
Criterion = teacher's marks	20.63	-
Number of words (NW)	130.81	+.73
Different words (DW)	80.15	+.75
Ratio DW:NW	0.64	-.50
Frequent words (FW)	75.56	+.73
Ratio FW:NW	0.58	+.04
Unique words (UW)	58.40	+.71
Ratio UW:NW	0.47	-.43
Ratio UW:DW	0.73	-.24
Word length's mean value	4.05	+.23
Word length's standard deviation	1.95	+.25
Number of symbols (NS)	13.81	+.72
Density of symbols (ratio NS:NW)	0.11	+.15
Sentence length (ratio NW:number of full stops)	12.41	-.20

Among the more interesting results can be pointed out the fact that the length (productivity) is so strongly related to the criterion. Further, the length of the sentences has a negative connection with the criterion. The negative value for the vocabulary in the compositions in relation to the length (ratios DW:NW) may appear surprising, but can be explained partly by the fact that compositions that are not very good often consist of lists of details from the stimulus picture.

The writing activities in the next table have been limited with the help of noticeable jumps in the attitude values. In that way we have got six very popular forms of activity and two clearly unpopular ones, including one activity that must be counted as a technical exercise.

Activities in writing

Designation	Mean value
Write a story from your own imagination	3,91
Read stories that your classmates have written	3,68
Write describing something you have yourself experienced	3,60
Write a letter to a friend	3,54
Write a diary	3,27
Write an account of something you have studied in General Subjects	3,24
...	
Write main points or key-words	1,92
Write an account that is to contain certain given words	1,90

To these values it can be added that the students voted 3.11 for "Correct your own compositions" and 2.81 for "Write a clean copy of your own compositions", in other words for activities that have for some time been considered relatively unsuitable in connection with free writing.

Using factor analytical methods, the written activities were divided into three types, bound, free and personal, which formed the basis for an experiment involving types of stimulus. Here an animal, the cat, was consistently chosen as material and the forms of stimulation varied according to these three types. An a priori dimension was added to them, namely objective-emotional, whereby the following six fields were obtained. The students were divided completely at random between the fields. So far in the calculations we have been able to take into consideration only one "productivity" variable, the number of words, and one "structure" variable, the number of words per symbol.

Experiment with types of stimulus

1. Number of words

	Bound	Free	Personal
Objective	120	127	165
Emotional	150	161	94

2. Number of words per symbol

	Bound	Free	Personal
Objective	6,96	8,72	9,33
Emotional	8,64	7,69	9,66

We find that the different types of stimulus function differently with regard to productivity and structure. Thus in school work the stimulus can be varied depending on the purpose of the writing exercise.

The same arrangement was retained for an experiment that also had the aim of making it possible to compare the language of children and adults. The tasks in the six fields are shown below.

Heading	Instruction	"Criterion"
The wonderful rescue	This book is about saving a friend who is in great danger	Gripe, M. Pappa Pellerins dotter. Wikström, C. Stå på dig Sverre.
A day at the Zoo	This book is about a tour among the animals	Linde, G. Med Lill-Klas i kappsäcken. Sjöstrand, I. Kalle Vrånglebäck.
An imaginary friend	This book is about how one would like a friend to be	Wikström, O. Sverre vill inte gå hem. Falk, A.M. Barbro finner en ö.
An evening at the fair	This book is about what one can do at a fair	Hellberg, H.E. Jan och Ann-Charlotte får en idé. Peterson, H. Bara Lise-lott.
An exciting competition	This book is about a competition with an unexpected result	Hammenhög, W. På stadion. Inger, N. Piglet Ek.
Planning to run away	This book is about thinking about running away	Ekerwald, C.G. Flippen rymmer. Falk, A.M. Barbro finner en ö.

No results have been presented, but suitable extracts have been taken from the criterion texts for the direct comparisons with the children's language.

A battery of creativity tests has been completed, consisting of three purely verbal and three partly verbal tests. The names of the tests are given in the following list, which also indicates that they are closely connected with earlier research in this field:

Everything can be better
Words describing what happens
What different consequences are possible
Writing several sentences with the same beginning
Different uses
Finding explanations for abbreviations

The scoring of such tests is difficult, and considerable work has been put into the task of constructing unambiguous scoring rules. The final degree

of scorer consistency then could reach values between .95 and 1.0. In the work underway the tests will be used i.a. in attempts to extract from the compositions of the pupils such characteristics or scores that are of a creative nature.

EFFECTS OF MATHEMATICS TEACHING: TEACHING ACCORDING TO THE CURRICULUM OF 1962 COMPARED TO TEACHING ACCORDING TO THE CURRICULUM OF 1969

Contacts: Ingrid Holmberg, Olof Magne

Background and aims

In a memorandum sent out in 1970 the National Board of Education requested evaluation of the results of the teaching in accordance with the curriculum of 1969 in certain subjects (including mathematics). "The continuous revision of the curriculum must not be allowed to proceed simply under its own impetus. It is out in the field that we must gather experiences and listen to the murmurs from the grassroots" (Dr. Lundh, the National Board of Education's advisory committee for educational development work). This study is intended to evaluate the effects of the introduction of laboratory material and the theory of sets into mathematics teaching - not simply to listen to murmurs. The subject of mathematics occupies a relatively large number of lessons in the comprehensive school (grades 1-9), and considerable demands are made on the knowledge and skills of the students in the subject. Parents and teachers who have not been altogether familiar with the terminology of the theory of sets have had many questions to ask about the purpose and effect of the theory of sets:

Do all categories of students, even the weaker ones, understand the reality that is expressed in abstract terms in the theory of sets?

Can the students at so early a stage understand and experience the relationship between the concrete operations they carry out and the terminology of the theory of sets, or are they two separate worlds for them?

In the latter case does this lead to negative attitudes towards mathematics?

Is this redisposition of both material and teaching methods an adequate adaptation of mathematics to the demands of the computer age and for a coordination of mathematics and logic?

The questions that this study is primarily intended to answer are: In which respects, if any, do the news in the curriculum of 1969 influence skill in mathematics, the development of the concept of numbers, and attitudes towards the subject?

Problems

The main object of the project is thus to study the effect of the introduction of a new curriculum in mathematics teaching with regard to

1. the development of the concept of numbers
2. skill in mathematics as defined in the curriculum
3. attitudes towards mathematics
4. the importance of aptitude for the three variables given above.

Procedure

Two intellectually and socially comparable groups of students, which had been taught according to the curricula of 1962 and 1969, are tested with test batteries that measure

1. precision in the conception of number (material from, for example, Piaget's and Lovell's investigations). These instruments, Numbers 3, Numbers 6 and Numbers 9, have been newly constructed and tested.
2. knowledge in mathematics (as defined in the curriculum). These instruments, Ma 3, Ma 6 and Ma 9, have been produced by subject specialists and tested.
3. attitudes towards mathematics (Attitude form H; tested 1972).
4. intelligence: Cattell Culture Fair 2A and 3A.

Subjects of experiment

Group A: 200 students from grades 3, 6 and 9 respectively, school year 1971/72, who have been taught in accordance with the curriculum of 1962.

Group B: 200 students from grades 3, 6 and 9 respectively, school year 1972/73, who have been taught in accordance with the curriculum of 1969.

The students are taken from different school districts that represent both town and country areas (Malmöhus county).

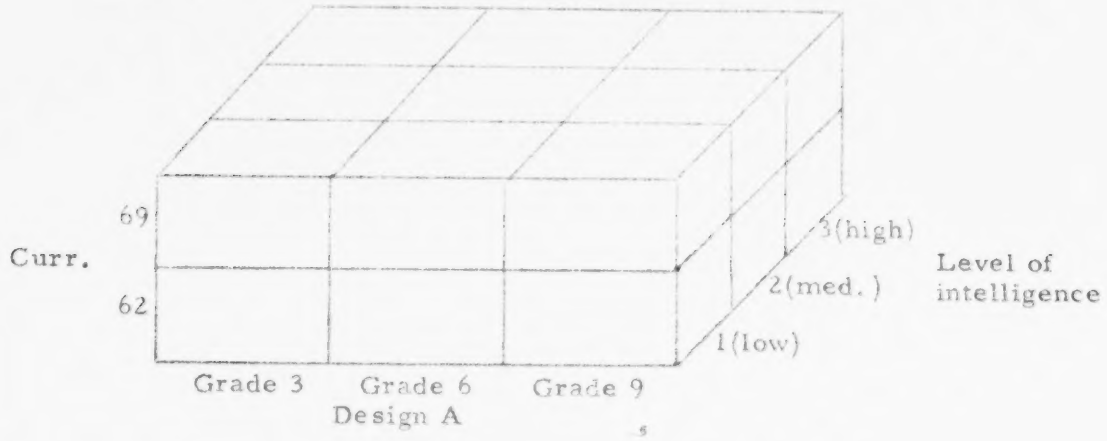
Collection of data

The tests were carried out in week 16 of 1972 for student group A and in week 15 of 1973 for student group B. The tests were administered as follows

Grade	Day 1	Day 2	Day 3	Day 4
	Int. test	Attitude	Conception of numbers	Skill in mathematics
3	CCF2A	H	Numbers 3	Ma 3
6	CCF2A	H	Numbers 6	Ma 6
9	CCF3A	H	Numbers 9	Ma 9

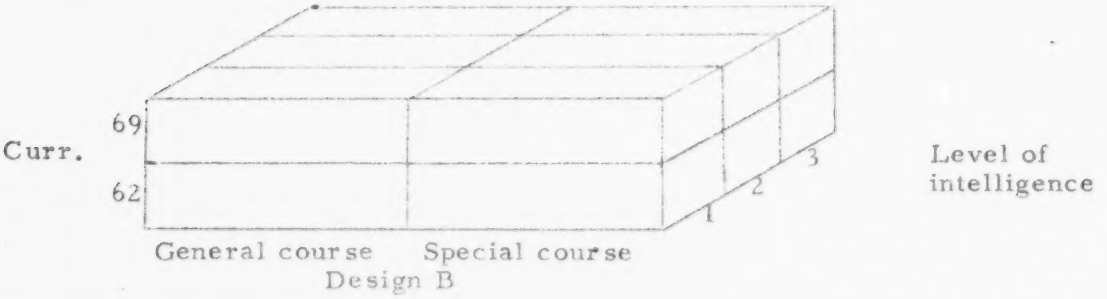
Design

A. The results for all grades are analysed for variance according to the following model:



Design A

B. Grade 9 is studied separately with regard to the division into general and special course.



Design B

Processing

The measuring instruments have been constructed in such a way that they can be used directly as a basis for punching. The data are transferred to punched cards at the Malmö School of Education and analysed at the Computer Centre in Lund (Computer program BMD 08 V).

Department of
Educational and
Psychological Research
School of Education
Malmö, Sweden

Abstract card

Bjerstedt, Å. (Ed.) Subject-matter oriented research: Some current projects at the Malmö School of Education. Didakometry (Malmö, Sweden: School of Education), No. 39, 1973.

The research being carried out at the Department of Educational and Psychological Research at the Malmö School of Education may be sub-divided into four major sub-sections: subject-matter oriented, instructor-oriented, pupil-oriented, and environment-oriented. Each section consists of a group of independent projects with some similarities in research area and approach. In the present survey report the major projects of the first of these sub-sections are presented.

Indexed:
1. Educational research, Sweden
2. Educational technology
3. Language instruction
4. Mathematics instruction

Reference card

Bjerstedt, Å. (Ed.) Subject-matter oriented research: Some current projects at the Malmö School of Education. Didakometry (Malmö, Sweden: School of Education), No. 39, 1973.